

ISAC Meeting – December 2011

ACTION OR INFORMATION ITEM

SPONSORING ISAC MEMBER: Stephen Phillips and David Starling

PRESENTER'S NAME/AFFILIATION: Stephen Phillips and David Starling

TOPIC: Recommendation that NISC support a National Academy of Science evaluation of potential frameworks for the validation of advanced invasive species detection methods.

1. DESCRIPTION OF AGENDA ITEM: The EDRR subcommittee proposes an ISAC recommendation to NISC that they support and encourage a National Academy of Science review of frameworks for the validation of advanced invasive species detection technologies and protocols such as environmental Polymerase Chain Reaction (eDNA) based assays.

DRAFT RECOMMENDATION: ISAC recommends that NISC encourage and support an evaluation by the National Research Council within the National Academy of Science of potential frameworks for the validation of advanced invasive species detection technologies and their protocols.

2. WHY IS THIS ITEM IMPORTANT TO NISC / ISAC? The detection of invasive species is critical to conducting timely EDRR, but is difficult in hard to monitor systems such as aquatic environments. Invasions can go undetected and strategic opportunities to halt the establishment or range expansion of invasive species can be lost. Several advanced technologies have been and are being developed that detect very low concentrations of invasive species DNA and other marker compounds. These methods offer great promise and increasingly being used. For example, environmental Polymerase Chain Reaction-based assays (eDNA) are increasingly used to detect the DNA from invasive carp and mussel species in water samples. In addition, eDNA methods for other species are being developed. This is a very active area of research and the EDRR subcommittee of ISAC anticipates that the number of target species and range of applications of these and other advanced technologies will increase. Federal resource managers and their non-federal partners are and will be increasingly called upon to make critical management and regulatory decisions based upon this type of evidence. Although these and other methods are rapidly moving from research applications to management and regulatory applications, there are no established validation processes for these detection methods or their sampling protocols.

Validation of methods and sampling protocols will allow resource managers to make reliable comparisons of data collected at different sites, over time, and from different laboratories. Validation will also establish clear standards that newer methods would have to meet to be considered superior to current methods. Validation and standardizing methods will support larger scale “meta” research derived from data collected by a range of individuals at different sites over time.

Currently, methods are primarily eDNA testing of aquatic samples. However, methods such as Monoclonal Antibodies, Molecularly Imprinted Polymers (MIP) and Solid-phase microextraction (SPME) could be (are) used to find trace chemical signatures of invasive plants, plant and animal pathogens, and insects in terrestrial systems. Regardless of what analytical technology is used or the target species, method and protocol validation is needed.

Validation frameworks exist for a wide variety of environmental analyses such as animal disease diagnostic testing, plant disease testing, pesticide and environmental contaminate sampling, and public health and food safety testing. Aspects of these systems may serve as models for the validation of invasive species detection methods and provide a partial infrastructure base which can be expanded to meet this emerging area of responsibility.

The National Research Council is within the National Academy of Science. It is a private not-for-profit organization that provides expert advice and conducts independent analyses. The Earth and Life Sciences division of the National Research Council alone produces 60-70 reports per year e.g., *Assessing the Relationship Between Propagule Pressure and Invasion Risk in Ballast Water* (2011). Other reports include: *Animal Health at the Crossroads: Preventing, Detecting, and Diagnosing Animal Diseases* (2005). The EDRR Subcommittee of ISAC finds that the National Research Council is an appropriate organization to conduct and analysis of existing method and protocol validation frameworks. They could also make recommendation concerning infrastructure gaps and existing elements that could be used to provide method and protocol validation for advanced technology-based invasive species environmental testing.

3. HOW DOES THIS ITEM RELATE TO THE 2008 – 2012 NATIONAL INVASIVE SPECIES MANAGEMENT PLAN?

This action relates to several EDRR Implementation Tasks, e. g, Implementation Task EDRR.1.1: Identify and evaluate monitoring efforts for high-priority invasive species and supporting technological infrastructure including an evaluation of their geographic and temporal coverage. Implementation Task EDRR.1.4: Enhance plant and animal pathogen detection methods.

4. PREVIOUS ACTIONS TAKEN BY NISC / ISAC ON THIS ITEM: This topic was discussed at the June 2011 ISAC meeting, and the EDRR Subcommittee has met and reviewed the draft recommendation.

5. ACTION REQUESTED OF NISC / ISAC: Discuss the draft recommendation and vote on a motion concerning the recommendation (see below).

6. ALTERNATIVES: 1) Accept the draft recommendation; 2) modify the draft recommendation and accept the modified recommendation; 3) return the recommendation to the EDRR subcommittee for further work; or 4) reject the draft recommendation.

7. ATTACHMENTS/BACKGROUND: In addition to this recommendation, members of the EDRR Subcommittee are working on “White Paper” directed at resource managers who are currently being asked to make management and regulatory decisions based upon eDNA-based evidence. This White Paper will contain non-technical guidance concerning the integration of eDNA data with data from other sampling protocols such as the microscopic examination of water samples for invasive mussels. It will provide suggestions concerning the interpretation of eDNA data such as the implications of positive presence data, false negatives, false positives, the need for replication, and the limitations of eDNA-based evidence.